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<u>Patent No.</u>	<u>Serial No.</u>	<u>Patent Date</u>	<u>US Filing Date</u>	<u>Confirmation No.</u>	<u>Attorney Docket No.</u>
7,279,711 B1	09/435,154	10/09/2007	11/08/1999	4834	SEL 142

Respectfully Submitted,



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Date: January 9, 2008

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US007279711B1

(12) **United States Patent**
Yamazaki et al.

(10) **Patent No.:** **US 7,279,711 B1**
(45) **Date of Patent:** **Oct. 9, 2007**

- (54) **FERROELECTRIC LIQUID CRYSTAL AND GOGGLE TYPE DISPLAY DEVICES**
- (75) Inventors: **Shunpei Yamazaki**, Tokyo (JP); **Hiroki Adachi**, Kanagawa (JP)
- (73) Assignee: **Semiconductor Energy Laboratory Co., Ltd.** (JP)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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Primary Examiner—Ori Nadav*(74) Attorney, Agent, or Firm*—Cook, Alex, McFarron, Manzo, Cummings & Mehler, Ltd.**(57) ABSTRACT**

The present invention relates to a semiconductor device including a circuit composed of thin film transistors having a novel GOLD (Gate-Overlapped LDD (Lightly Doped Drain)) structure. The thin film transistor comprises a first gate electrode and a second electrode being in contact with the first gate electrode and a gate insulating film. Further, the LDD is formed by using the first gate electrode as a mask, and source and drain regions are formed by using the second gate electrode as the mask. Then, the LDD overlapping with the second gate electrode is formed. This structure provides the thin film transistor with high reliability.

20 Claims, 35 Drawing Sheets

- (21) Appl. No.: **09/435,154**
- (22) Filed: **Nov. 8, 1999**
- (30) **Foreign Application Priority Data**
- | | | |
|---------------|------|-----------|
| Nov. 9, 1998 | (JP) | 10-318197 |
| Nov. 17, 1998 | (JP) | 10-344893 |
- (51) **Int. Cl.**
- | | |
|--------------------|-----------|
| H01L 27/108 | (2006.01) |
| H01L 29/04 | (2006.01) |
| H01L 29/76 | (2006.01) |
| H01L 27/01 | (2006.01) |
- (52) **U.S. Cl.** 257/69; 257/72; 257/344; 257/351
- (58) **Field of Classification Search** 257/347, 257/351, 344, 412, 69, 72; 438/305
See application file for complete search history.
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